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Feature Story

Each month we provide a feature article on key industry trends and developments. Authored by a member of Intel's Executive Staff, it offers insightful and useful information for product development, planning and execution.

Inside Looking In

Senior Technical Marketing Manager for Platform Technologies Tim Mostad gives you a fresh perspective on the latest technologies making their way onto Intel Architecture platforms. Tim lets you see the work through the eyes of the people making it happen and lets you hear what they really think. It's straight talk from developers to developers.

Pentium® III Processor Platform Series

Pentium® III Processor Platform Series PSN will bring you focused articles on the hottest technologies about to arrive on Pentium III processor-based platforms. From Rambus memory technology to optimizing software, it's news and information you can definitely use, and you'll find it every month here in PSN.

Top News Stories

Delivering an in-depth report on key platforms, products and technologies, our Top Stories provide a monthly source of information on the issues affecting hardware developers. Be sure to check in every month for the latest stories that are driving the evolution of the industry.

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On behalf of all of us at Platform Solutions, welcome to the future of the PC platform!

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Feature

The Internet: Driving Change and Opportunity in Applied Computing

By Ron J. Smith
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The Internet is driving changes in the landscape of computing. Cost-effective processing power and proliferating connectivity are stimulating a broad class of "applied computing" segments that creates new opportunities—and challenges—for developers.

The Internet is driving changes and creating new opportunities in many traditional—and some not so traditional—computing market segments. The traditional embedded market segment has seen processing power grow more affordable and connectivity proliferate with the growth of the Internet.

“Applied computing” is a new term used to describe classes of dedicated or fixed-function devices that are now becoming connected, often via Internet Protocol (IP)-based networks or the Internet itself. Examples of these applications include voice/data communications, transaction processing, and wireless remote access. The relevant factor for the industry is that this trend toward more processing power and greater connectivity is creating a rich field of new opportunities for hardware and software developers.

The Challenge of Working in “Internet Time”

While the emergence of applied computing creates interesting opportunities for developers, it also poses a unique set of challenges. Thanks to the Internet, the pace of technology evolution is accelerating as never before. We find ourselves working in “Internet Time.” In this Internet-driven environment, it is more important than ever to be fast-to-market with innovative designs. While applied computing product life cycles may be longer than life cycles for desktop computing products, developers also face a growing pressure to create innovative, highly differentiated products in less time and at less cost, while meeting ever more demanding application requirements.

Many developers are discovering that Intel® technology can add dramatically new levels of performance, application support, and Internet-based connectivity to enterprise and applied computing products. Platform solutions from Intel support some of today's most intriguing product applications, ranging from Internet appliances to retail and financial transaction terminals, industrial PCs, and communications systems for advanced IP-based voice and data applications.

Intel® Platform Solutions for Applied Computing

Intel® platform solutions enable developers to hit the ground running to create fast time-to-market designs for applied computing products. Each platform solution is complete with silicon and software building blocks, platform-specific reference configurations, hardware and software development tools and technical support, backed by Intel product quality, reliability, and worldwide manufacturing capacity.

Another advantage of Intel® Architecture platform solutions is that they enable developers of applied computing products to take advantage of the development infrastructure developed by the PC industry for enterprise computing products. These include technologies, tools, and technical support for fast time-to-market designs.

Developers of applied computing products also benefit from Intel's strong roadmap of products based on advanced technologies. While Intel products are driven by PC and server performance requirements, platform building blocks for applied computing are tailored to meet unique requirements for performance and value. The latest additions to this silicon roadmap include high-performance Intel® Celeron™ processors, now offering support for embedded product life cycles.

To support balanced system performance in applied computing applications, Intel offers a wide range of platform building blocks in addition to processors. These include Intel® chipsets such as the [Intel® 440BX AGPset](#) optimized to enhance Intel Celeron processor performance, [Intel® StrataFlash™](#) and [Advanced+ Boot Block](#) flash memory for the flexible storage of code and data in Internet and communications applications, Intel® graphics controllers, intelligent I/O processors, network controllers and bridge chips. (For more details, please see the article on the [new embedded Intel Celeron processors](#) in this edition of *Platform Solutions*.)

For applications requiring extremely low power and high performance, Intel offers the StrongARM® architecture. Intel's StrongARM processors combine power, performance, and low cost for handheld companions and wireless communications devices. Intel's next generation of StrongARM processors is currently in development.

Providing the Foundation for Innovation

From Internet appliances to handheld computing devices and high-performance retail transaction terminals, applied computing encompasses many of today's fastest growing Internet-driven computing market segments. Intel platform solutions provide the foundation for innovation, simplifying the design process and enabling developers to focus their resources on delivering innovative and highly differentiated products in less time, and at less cost.

About the Author

Ron J. Smith is Vice President and General Manager of Intel's Computing Enhancement Group (CEG) and a 20-year veteran of Intel. CEG focuses on platform solutions for a wide range of computing and communications devices.

StrongARM™* is a trademark of Advanced RISC Machines.

Inside Looking In

Boiling Technology Frogs

By Tim Mostad
Senior Technical Marketing Manager
Intel Corporation

Every technology company needs to decide when to stay with a technology standard, and when to jump to something new. This month, Tim Mostad looks at how the process works at Intel and throughout the industry.

There is a parable about what happens to a frog in a pot of water if the temperature rises very slowly. Whereas a frog dropped into boiling water will jump out, the frog in the slowly heating water, lacking a clear warning sign, ends up boiling to death. Every company in the technology business is a frog. The by-product of our competition, relentless incremental change, slowly increases the heat that eventually threatens to boil us all. We have to artificially create discontinuities that both protect us and enable us to sense change so we can find ways to survive.

Standards insulate us from constant change. In the case of PC platforms, we in the new platform technology part of Intel work hard to create "interface specifications." The goal is to freeze technology evolution long enough to enable multiple companies to make interoperable products. Somebody has to establish an unmoving target long enough for the industry—and users—to profit from technical advancement; making money enables us to withstand the heat just a little longer.

Even as we develop standards, we know they'll eventually be obsolete but there appears to be an optimal obsolescence "rhythm" that we can affect. Too slow an obsolescence rhythm means fragmentation. When standards evolve too slowly, the companies that use them start to differentiate, and differentiation in a standard is an oxymoron. We saw novel uses for PCI "Reserved Pins" because revisions to the PCI Specification were apparently too slow by industry standards.

Conversely, too rapid a development rate drains the energy from the industry. Companies just opt to watch from the sidelines instead of competing, and the technology gets a slow start. In the end, immeasurable money, time, and leadership credibility are wasted. We at Intel seem to experience this phenomenon when we decide that "we just must have something in the market" by such and such a time. These are code words for us knowing there isn't time to do the job right by getting a widely accepted set of industry standards in place. (Fortunately for the industry, in this example, it's mostly only our own money we waste.) Developing standards at the right speed avoids these maladies: the next new technology standard is there just when we need it.

How do we know when we've found the right rhythm? One indicator is "Not Invented Here," or the infamous NIH syndrome. It's a natural characteristic of engineering groups in potential adopter companies. Adopting another company's work is very uncomfortable, especially for companies that consider themselves technology leaders. Specifications answer the "what" not "why," so they seem incredibly arbitrary. I spent much of my time as a PCI technology TME simply overcoming NIH by answering the why's of PCI for the PCI Special Interest Group. (Since this is primarily an engineering company, we had no shortage of this problem.) When seeking to establish standards, developers have to carefully judge the industry's NIH temperature gauge to be sure we are not pressing too hard.

We try to balance NIH by marketing the “opportunity model” of new interface specifications. The natural engineering response to NIH is an endless stream of minute tweaks to existing interfaces. However, unlike the transition from ISA to PCI, little money was made in the transition from PCI 2.0 to PCI 2.1. The initial release of PCI created an opportunity to differentiate from the old ISA standard, whereas incremental changes to PCI reduced the motivation to differentiate within the current specification by filling feature gaps. This balance is a good thing since it extends the interval until something new comes along and, at the same time, prevents the opportunity to profit from innovation from being wasted.

So when does the “jump” warning sign pop up like the little gauge on a roasting turkey? Evidence suggests that it occurs at the initial technology release plus one major update. PCI, USB, and AGP are all approaching or past their first major update (going to Release 2.X). Significantly different replacements are being developed for the long term. Similarly, the original PC architecture was replaced by the PC/AT, effectively becoming Rev. 2.0, and we have been tweaking it ever since, missing the opportunity to reap economic rewards. The next revision will be revolutionary, and the “ease of use” folks are plotting big steps right now, including ISA bus removal, extraordinary new form factors, and human factors design that would make my grandparents feel comfortable using a PC. Even PCI is beginning to show its age.

When standards are developed wisely, they provide a mechanism to deliver technology and generate profit. However, standards are not a panacea; sometimes boiling may not seem so bad compared to taking a random leap. Consider your direction very carefully and remember that your company's existing technology is not getting better, it's just getting older. And when it comes to adopting standards, remember they get old too. Standards, for all they are worth, must come and go. Adopting any one of them won't keep you out of hot water forever.

About the Author

Tim Mostad says, "the majority of my 18 years at Intel have been spent in the pursuit of technical marketing nirvana." He is responsible for demos, white papers, plugfests, and technical training to support the adoption of new desktop technologies.

Pentium® III Processor Platform Series

This new column provides the latest information on platform technologies arriving with the Intel® Pentium® III processor.

New 3D capabilities open doors on (and off) the Net

By Scott Cassidy
Manager
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Thanks to substantial increases in processor power, real-time publishing has arrived. Instant rendering, scalable 3D and real-time movement are all at the designer's fingertips. It's time to say goodbye to dullness and hello to "killer content."

If you think about it, what we accept from computer graphics doesn't make sense. We live in a 3D world, but 2D graphics still get the "way cool" label. Part of the problem has been the expense—all the camera angles that make the Super Bowl-quality commercials on TV don't come cheap. And most computer-generated graphics just haven't been able to keep up with what our brains are begging for.

Until now.

The days of preparing background scenes for animation in advance are numbered thanks to new technological advancements like the Intel® Pentium® III processor. Enriched graphics, more realistic presentation of real-life products, scalability, real-time rendering, and improved image quality are all available today, for almost the same cost as the 2D standard.

So if you're a content creator that's been frustrated with what your computer could do, or you've put a plug into your creativity, say goodbye to dullness and hello to killer content.

Unleash Your Creativity

Thanks to substantial increases in processor power, real-time publishing has arrived. Instant rendering, scalable 3D and real-time movement are all at the designer's fingertips. This has allowed the creative community to evolve and provide a fully interactive experience in addition to the linear movie playback environment.

In the 2D world, animation went like this:

A character entered a room, filled with canned scenery and backgrounds. The character's movement was limited by the pre-set furniture and walls. If the character moved, the next background was inserted behind him. Camera angles, so to speak, were fixed.

In the world of real-time 3D, it's a completely different experience. The character enters the room and as he turns, the "camera" turns with him. Every element in the scene has potential to be touched, moved, turned inside out. And it's all done in real time. Objects can be picked up, turned and inspected from every angle. Characters can communicate with users. Or, in the real world, kiosks can tell people the best route from where they are to where they want to be.

The applications for this technology are endless. Yes, surfing the Net will be a whole lot better. But even more important is the potential impact on commercial and service industries across the spectrum.

- Architectural renderings are now more fluid and seamless
- Sales and e-commerce benefit from interactive demos and “lifelike” product presentation
- Engineering designs can be evaluated from all sides and angles in real time
- Computer-based training at every level in the educational process is now elevated
- Games and computer entertainment are more immersive
- Medicine and science benefit from greater detail in cell model simulations, for example
- Advertising can take the consumer through the product, instead of just “showing it”

In other words, virtual reality is now a lot less “virtual” and incredibly more “real.”

Intel’s Role Setting the 3D Standard

Intel has been a driving force behind making 3D more accessible and easy to use. With our focus on improving the richness of the experience, our work within the industry has focused on lowering the costs of capture, improving playback engines and making 3D authoring easier and more accessible.

Products like Macromedia Shockwave* and Flash* have been optimized for the new Intel Pentium III processor. At Intel’s press preview day for the Pentium III, a number of ISVs demonstrated some of the latest 3D technologies.

Haptek, a young company in Santa Cruz, presented virtual characters that represent a new form of Web entertainment. With most of the work done on the end users local processor, Haptek is able to provide human-like characters that interact with the user—in 3D and utilizing speech synthesis and real-time rendering.

Shells Interactive demonstrated 3D dreams for Director*, which extends multimedia authoring and environments such as Macromedia Director. 3D Dreams adds a new dimension for developers previously limited by traditional 2D technology.

Through a co-development agreement with MetaCreations, Intel was instrumental in developing the MetaFlash technology. The MetaFlash* solution will be produced by Kodak and Minolta and incorporated into their digital cameras lines. This will lower the cost of hardware required to capture photo-realistic 3D models from \$25,000 to under \$3,000 by the end of summer ’99.

The ability to create totally cool content in 3D or to write tools that support cool 3D content are available today and more affordable than ever. So pull that plug that’s bottled up your creativity, fasten your seatbelt and get ready to fly. Thanks to Intel’s efforts in the world of 3D graphics, the only thing limiting your ability to produce BIG content is your own imagination.

About the Author

Scott Cassidy is manager of Intel’s Content Group, New Capabilities program. Through his work with the developer community, Scott’s focus is on bringing compelling new experiences and capabilities to the PC. Scott is always looking for solutions that will benefit from future generations of Intel® processors and platform architecture. From this, Intel works to support the adoption of new technologies and the acceleration of product development.

For More Information

- [Main page](#)
- [Haptek](#)
- [MetaStream](#)
- [Macromedia Flash](#)
- [Macromedia Shockwave](#)

Improved Tools for Core Software Development

By Tracey M. Erway
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Intel and other software developers have taken the first steps toward increased accessibility to a wider range of programming skills. For the first time tools are available that add ease of use, flexible technological opportunities, and overall performance.

Imagine that you're a carpenter. When you decided to pursue carpentry, you were given a toolbox with three bright, shiny new tools—a hammer, a wrench, and a saw. You didn't have quantity, but you had quality. And you had just enough variety to get the job done.

Programmers, content creators and software developers are a lot like the carpenter. Like the carpenter, you started your career with a basic set of tools, and for the most part you've done very well.

But a number of years have passed, and you haven't been given any other tools. You're still able to do what's expected, but within a very limited range. And, with each passing day, you find that your customers want more and more from you and that basic set of tools. Miracles that only master carpenters can create.

Pretty frustrating, isn't it?

Power Alone Doesn't Do It

Historically programmers intent on high-performance applications have been limited to hand optimizing using low-level languages. One "solution" was to add power, but megahertz alone is proving to be insufficient. Ever-increasing complexity in CPU optimization techniques are driving development schedules further and further out.

Developers have still been facing the same problems.

- High development costs in terms of time and resources.
- Frustration in not being able to do what they dreamed they could do.
- Ability to deliver the technology consumers ask for, using existing tools, is limited to those with the highest level of programming skills.

Introducing: A New Set of Tools

Today, Intel and other software developers have taken the first steps toward increased accessibility to a wider range of programming skills. The basic tools are still in the toolbox, but they are better than anything available to date. And there are more of them.

For the first time tools are available that add ease of use, flexible technological opportunities, and overall performance. The basic functionalities are the same, but the capabilities represent a quantum leap forward. Going back to our carpenter, it's like taking away his chisel and replacing it with a laser beam. He can still chisel, but with much greater ease and speed.

Lowering development costs in terms of time and resources is the goal for these tools—far greater gain in a much shorter time. Performance can now be increased through higher level programming constructs. Performance analyzer tools go further into the CPU and related chipsets while extending outward into the system.

The speed of the processor takes us that much closer to being able to utilize new technologies (MPEG2 real time, physical modeling, etc.), but the performance increase available within the new technologies from the use of these new core development tools pushes these technologies over the performance edge into reality. The advent of the Intel® Pentium® III class processors and the tools developed just for that class of processor, have opened up the availability of APIs for complex 3D, video, imaging, and audio engines, and their combined use.

Intel's interest is in developing and supporting the development of core tools that keep up with the new processors, like the Intel Pentium III processor. Developers can begin to assume a certain level of performance and associate that with a much shorter development time frame. The complexity of new applications can now move from the programming side back to the creativity side as developers learn what technologies are available and how they can use them in their products.

The Future is Unlimited

To minimize the learning curve, these exciting new technologies were created to function within existing developer environments. The new tools are an extension of the old sets and complete the programming package more effectively. For example, we can now add a layer of abstraction to the programming optimization via intrinsics, utilize new ways to analyze system performance and take advantage of single window debugging solutions for complex Windows*-based systems. And the tools are being ported to multiple OS's.

Are these new tools a standard for the future? Probably not. But that's the most exciting part of the story. These new tools represent the first steps through the door to remarkable opportunity and creativity. Imagine a future where high-performance applications are a "given." Where development tools are usable by everyone, and more efficient than ever before. What once required 70 individual tasks may now be automated by five.

This is a compelling vision for the future of programming technology. And thanks to the shiny new toolbox, developers are well on the way.

About the Author

Tracey M. Erway is manager of Core Software Development Tools with Intel's Content Group. An Intel employee since 1989, Ms. Erway is a graduate of Allegheny College. She currently works with the developer community to enhance the environment for PC software development for Intel's latest processors. Prior to this, Ms. Erway was an embedded software consultant and a technical editor for Webmaster Expert Solutions. She was also a core member of Intel's original World Wide Web site development team, focusing on navigation.

For More Information

Visit [Intel® Software Performance Products](#) for more information about Intel's C/C++ compiler with intrinsics technology, IPEAK Graphics Performance Tool and VTune™ Performance Analyzer.

Information is also available on specific software [products that support Intel® technology](#) and at the following sites:

- [MPEG2 real-time encoding/decoding of video](#)
- [Compression and JPEG technologies](#)
- [MPEG2 real-time video](#)
- [Multi-resolution mesh plug-ins for Kinetix 3D Studio Max](#)
- [Easy debugging software tools](#)
- [3D API and development environment](#)
- [Optimized game engine and games](#)
- [Optimized 3D API](#)
- [Optimized 3D game engine](#)
- [Wavelet technology & JPEG compression](#)

Top Stories

Intel® Celeron™ Processors Power Embedded Platforms

By Sharon Steppe
Product Marketing Engineer
Intel Corporation

Intel has brought the value-based Celeron processor to applied computing market segments to meet emerging performance requirements in some of today's most dynamic Internet-driven applications.

The Internet and related technologies are changing the way we work and play. The Intel® Celeron™ processor provides the horsepower to bring Internet technologies into new areas, enhancing our lives and improving productivity. Intel has brought the value-based Celeron processor to applied computing market segments to meet the emerging performance requirements in some of today's most exciting Internet-driven applications. This article will describe how the power of the Celeron processor brings Internet technologies to transaction terminals, industrial PC, and communications applications.

Internet Technologies and Transaction Terminals

Internet technologies are changing transaction terminals in new and exciting ways. Traditional point-of-sale (POS) devices are being rapidly replaced by a new generation of computing devices that includes PC-based POS terminals, retail kiosks, services kiosks, gaming machines, and ATM machines. Internet technologies and the power of the Celeron processor can bring JPEG imaging, Java, video and audio to the transaction terminal segment. In retail stores for example, imagine that an image of the product you are purchasing is displayed on the terminal, to ensure it is correctly priced and to reduce the possibility of error or fraud. In transaction applications, 3D graphics can make the terminal easier to use and provide more features, increasing the capability of the terminal and reducing training time for employees.

In Las Vegas, users can find gaming machines that integrate 3D graphics, video, and high-speed connectivity, enabling them to be monitored remotely. Imagine ATM machines with the ability to provide real-time customer support by answering questions with video, voice, and data images displayed directly on the machine.

Internet Technologies and Industrial PC Applications

Incorporating Internet technologies into industrial PC applications enables centralized and remote access to manage and control industrial computers. This enables manufacturing data to be integrated into real-time business processes and enterprise software. Internet-based industrial PC's can be managed remotely to reduce factory downtime. With this level of connectivity, the factory floor computer can immediately send an email if there is a system problem. In addition, the Celeron processor provides the developer with an easy-to-use building block for industrial PC applications.

Internet Technologies and Communications Platforms

The emergence of Internet-driven applications within the communications market segment, including e-commerce, billing databases, security, caching, and interactive voice response, is creating a need for higher performance and processing power. The convergence of voice and data over IP networks is also driving the deployment of new applications that demand higher performance and platform scalability in 'server blade' applications. Major corporations have evolved the World Wide Web into a powerful and influential communications tool. The ability to deliver video to the home further drives the need to support voice and data simultaneously.

Performance to Drive Internet Technologies to the Next Level

As shown by the examples cited above, Internet-driven embedded applications must be able to support demanding new software applications for networking, communications, and graphics, and these in turn require higher processor performance. The Celeron processor delivers.

The Celeron 300A and 366 MHz chips feature Intel's dynamic execution P6 microarchitecture core with a 66 MHz multi-transaction system bus with Level-2 cache interface. In addition, the processors feature 128 Kbytes of unified, non-blocking Level-2 cache that operates at the same speed as the processor. It improves performance by reducing the average memory access time and provides fast access to recently used instructions and data. The large on chip cache reduces the traffic across the main memory bus, freeing memory bandwidth for networking or graphics traffic. MMX™ technology is also provided to enhance the performance of applications for transaction terminals, JPEG imaging, and video processing.

Delivering Performance + Value

While many embedded application segments require higher performance, developers must also address the issue of value. The Celeron processor for embedded applications meets the emerging product requirements for value conscious developers. With the scalability of the Celeron processors, designers will benefit from quick time-to-market, simpler design upgrades, and embedded life cycle support for both software and hardware components.

New 370-pin Socket Package

Intel® Architecture platforms for applied computing are moving into smaller and lighter form factors. In these space-constrained applications, the Celeron processor in the socketable 370-pin plastic pin grid array (PPGA) package can save valuable board real estate. The processor package measures just 49 x 49 mm. This new package also gives the processor a low profile that can help designers reduce product form factors, while minimizing product costs. Intel's strong Celeron product roadmap supports future Socket 370 implementations. Moving designs to this specification ensures top performance, with the scalability required for future design requirements.

Design a Platform Solution with the Intel® 440BX AGPset

The Celeron processor for embedded applications and the Intel 440BX AGPset are key components of Intel® platform solutions for applied computing that include platform-specific reference configurations. Intel has designed the Celeron processors and the 440BX AGPset to work together for optimized performance. Like the Celeron processors, the 440BX AGPset supports embedded product life cycles.

Graphical interfaces, graphics and JPEG imaging applications, and video support are growing in importance in applied computing segments. To support them, the 440BX AGPset enhances the performance of the Celeron processor with Quad Port Acceleration (QPA) to improve bandwidth between the processor, SDRAM, the PCI bus, and the Accelerated Graphics Port (AGP), in selected systems. The 440BX also includes improved bus arbitration, deeper buffers, and open-page memory architecture. In addition, designing with the 440BX AGPset provides developers with a cost-effective way to ensure designs will be ready for future 100 MHz bus implementations.

The Internet is driving the need for new performance in applied computing applications. The Celeron processor for embedded applications delivers the performance that today's—and tomorrow's—applications require.

About the Author

Sharon Steppe is a Product Marketing Engineer for embedded Intel Architecture. She currently manages the Celeron processors for embedded applications. Sharon has been with Intel for 6 years.

For More Information

- Visit the Intel Developer Web site for a [product overview](#).
- A downloadable [datasheet](#) is available.
- A 370-Pin Socket [Design Guidelines](#) is available for download.
- Visit [Celeron processor questions and answers](#) for information on processors, chipsets, and tools.

Driving DVD Compliance

By Rajesh Shakkarwar
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Intel Corporation

With the rapid emergence of DVD, compatibility and interoperability issues are more important than ever. By helping to resolve these issues, Intel is working to drive DVD into the mainstream of computing.

DVD is positioned to have a dynamic effect on the PC platform over the course of the next few years, thanks to the many advantages associated with the technology. From rich interactive games that integrate 3D graphics and video to movie and audio playback, DVD promises to make user experiences more compelling than ever before.

Even more exciting, DVD opens the door to a host of new applications that will allow people to do such things as create and share home movies, music, and other interactive media. Imagine, for example, using your PC to convert your vacation camcorder video capture to a DVD home movie and a rewritable DVD media, and then shipping it to Grandma to watch on her consumer electronics DVD video player.

DVD's high capacity—approximately equal to the capacity of seven CDs—ultimately translates into capabilities such as more storage, Dolby* Digital audio, high-quality MPEG* 2 video, the ability to combine interactive PC and linear movie content, and Internet connectivity (WebDVD), to name just a few examples. As such, it represents an important convergence point for PC technology and consumer electronics moving forward.

But in order for DVD to become a truly standard peripheral in the same way that CD ROMs and floppy disk drives are standard on many PCs, compatibility is key. As recently as a year ago, when the technology was still relatively in its infancy, DVD was beset by many compatibility and interoperability problems. The industry infrastructure was unsettled, and the earliest implementations were designed without the benefit of defined test specifications to ensure any kind of compliance.

Resolving the Issues

Over the course of the last year, however, much progress has been made in the effort to resolve DVD compliance issues. And Intel has been one of the companies in the forefront of the ongoing work across the industry to help accelerate the emergence and adoption of DVD.

Intel's first step was initiating the Durango program, chartered with working to ensure the interoperability of interactive DVD titles developed for the PC platform. Durango involved considerable testing, root cause analyses of failures, developing solutions to problems, and sponsoring industry-training sessions. Soon after, Intel rolled out Durango II, which built on the work of its predecessor by testing and characterizing DVD movie playback on PCs. In addition, Durango II defined test specifications for PC DVD which are designed to handle the testing of complete systems, upgrade kits, DVD codecs, and interactive content.

Beyond Durango, Intel hosted six DVD "Plugfests" around the world to promote DVD compliance and interoperability, following on the heels of several successful DVD Plugfests held in 1997. And at the Intel Developer Forum Conferences (IDF) in September of 1997, September and February of 1998, and February of this year, Intel offered extensive DVD training tracks that were well-received by IDF attendees.

Collaboration for Compliance

Intel has also worked closely with other companies to accelerate DVD learning curves and resolve compliance issues. One of those companies is Microsoft*, with its new DirectShow* API. A key benefit of DirectShow is the fact that it provides a standard API that offers compatibility improvements over MCI*, the previous API for developing DVD content. To shorten the learning curve and accelerate DVD content development using DirectShow, Intel and Microsoft co-sponsored the first DVD and DirectShow Developer Days conference, held earlier this year.

In addition, Intel currently chairs the Verification Task Force (VTF), a body within the industry's DVD Forum Steering Committee which is responsible for all DVD compliance-related matters and is defining test specifications for all DVD product categories, spanning the consumer electronics, PC, motion picture and entertainment industries. In the coming months, the VTF will be delivering official DVD product test specifications to enable developers and manufacturers to test their products in a consistent way. The specifications will also be used to establish a direct correlation between compliance and the right to use the DVD logo on products.

Finally, Intel has developed a tool for original equipment manufacturers and system integrators to test DVD products. Known as DQUICK, the kit has evolved from a utility to become an integral part of the Intel® Performance Evaluation and Analysis Kit (IPEAK), which helps ease technology adoption and platform performance tuning.

DVD is Here

Already, the motion picture industry has introduced some 2,500 DVD movie titles, while more than 350 interactive DVD titles have been released or are currently in development. In addition, all major PC OEMs are shipping PCs with DVD-ROM drives. As DVD flows into the mainstream, interoperability and compatibility become increasingly important to ensure customer satisfaction. Intel remains committed to doing its part to enable this technology; be sure to keep an eye on future issues of Platform Solutions for more news on DVD compliance in the months to come.

About the Author

Rajesh Shakkarwar is a program manager responsible for Intel's DVD activities, and has played a key role in the widespread adoption of DVD technology on the PC platform. Rajesh is a member of the DVD Forum Steering Committee, and he currently chairs the VTF—a DVD Forum organization chartered with ensuring compliance of PC, consumer electronics, and motion picture DVD products.

For More Information

For more information on DVD compliance and related activities, please check out the following Web sites:

- [PC Developers](#)
- [PC Consumers and End Users](#)
- [Press Activities](#)
- [PC Compatibility and InterOperability Testing](#)
- [PC DVD Newsgroup](#)

Consumer Videoconferencing: The Picture Brightens

By Jay Gilbert
Senior Technology Marketing Engineer
Intel Architecture Labs
Intel Corporation

Changing standards and technologies mean that videoconferencing technology—and the hardware and software products based on it—are becoming commercially viable for the first time.

For decades, the idea of a picture phone—i.e., a simple home-based videoconferencing system—has captivated the imaginations and research and development budgets of scores of visionaries and entrepreneurs. Despite many commercial attempts, consumer videoconferencing has remained more pipe dream than communications panacea.

In the past several years, however, this has all begun to change. The increasing use and viability of videoconferencing in corporate settings has exposed a much larger audience to the benefits of videoconferencing, fueling increased interest on the consumer front. But even more importantly, the technologies, standards, and infrastructure required to support consumer videoconferencing are undergoing significant change. As a result, videoconferencing technology—and the hardware and software products based on it—are becoming commercially viable for the first time.

Both Intel® Architecture Lab's Conferencing & Telephony Initiative and the videoconferencing industry have focused efforts aimed at developing consumer-based videoconferencing technologies and products. In order for this new category to be readily accepted by a mass audience, however, old perceptions must be changed about quality, costs, ease of installation, and scalable performance.

More than a Word Processor

Today's multimedia computers provide the ideal platform for videoconferencing. Armed with a powerful microprocessor, audio and video capabilities, a microphone and speakers, all a personal computer needs is a camera and videoconferencing software to be transformed into a powerful videoconferencing system.

To simplify the end-user installation process, complete consumer videoconferencing systems-in-a-box are now widely available. For example, the all-inclusive Intel® Create & Share™ Camera Pack includes a camera (either USB or PCI based), videophone software, and a variety of additional PC imaging applications such as video or snap-shot email postcards, a home page builder, and a movie creator.

Simplifying camera and software installation and setup for end-users is one critical step in making videoconferencing pervasive, but equally important are improving the enduser experience including reliability, image quality, setup, and tuning—all of which are integrated into the latest version of Create & Share software.

Emerging Standards

Intel has been instrumental in the definition, development, and application of key standards associated with videoconferencing. For example, Intel has been an active participant in the International Telecommunications Union (ITU)-approved H.323 specification, which defines how PCs interoperate to share audio and video streams over computer networks, including intranets and the Internet.

The H.323 specification describes terminals, equipment, and services for multimedia communications over Local Area Networks that do not provide guaranteed service quality. The H.323 terminals and equipment may carry real-time voice, data, and video, or any combination of them—including video telephony.

With H.323-compliant software, any PC user with a camera and modem can videoconference with any other PC user running H.323-compliant software. The ubiquity of H.323-compliant applications and infrastructure on the Internet are the foundation for a new class of PC-based people-to-people communications.

Future releases of the standard will address Quality of Service issues to further improve end users experience. For example, H.323 release 2 will support a quick connect capability. Once a connection has been established between users, it typically requires six round-trip communication delays totaling in the hundreds of milliseconds between end points to coordinate capabilities—audio codec, video codec, and bandwidth requirements. With release 2, just two round trips will be required to synchronize connections, providing faster connection and improved experiences for end-users.

Another important standard on the consumer videoconferencing front is H.324, which specifies a common method for video, voice, and data to be shared simultaneously over regular analog/POTS (Plain-Old-Telephone System) connections. It is the first standard to specify interoperability over a single analog line.

The H.324 standard uses the typical 33.6-Kbps modem connection between callers. Once a modem connection has been established, H.324 specifies how digital video and voice compression technologies are used to convert sounds and facial expressions into a digital signal. It defines how these signals are compressed to fit within the data rate allowed by an analog phone line and modem connections. The maximum data rate allowed by modems is up to 33.6 Kbps. Voice is compressed down to a rate of about 6,000 bps, while the video picture is compressed into the remaining bandwidth allowed by the modem connection.

Standards, such H.323 and H.324, along with other evolving standards for wireless and ATM communications, cable modems, and XDSL technologies will ultimately enable products from multiple vendors to work together transparently, fueling greater use and improved capabilities.

Bandwidth on Demand

Streaming multimedia and videoconferencing applications are also behind the drive for broadband communications capabilities and an improved communications infrastructure. As these applications gain acceptance, users will demand image-based sessions free of the “jerky video” experience common among consumer videoconferencing sessions today. A variety of new services and capabilities are under development to meet these needs. For example, emerging bandwidth-on-demand capabilities, such as RSVP technologies, will ultimately enable users to request a fixed amount of bandwidth for a function while connected to the Internet.

While consumer videoconferencing may not yet be nearly as ubiquitous as Web access or email, the future looks bright. By providing scalable performance via new generations of more powerful PCs, and eliminating poor performance, high costs, and difficult installation and use, Intel and other videoconferencing players are delivering on the ultimate promise of consumer videoconferencing: a TV-like connection that opens a whole new world of communications possibilities to people everywhere.

About the Author

Senior Technology Marketing Engineer responsible for Intel® VideoPhone conferencing products and their deployment/distribution to the market.

For More Information

- Intel® Create & Share™ Camera Pack [product and technology information](#)
- To learn about ITU standards and standards-related activities, visit [the International Multimedia Teleconferencing Consortium](#) and [International Telecommunications Union \(ITU\)](#).

Boot Integrity Services: Safeguarding the Integrity of Managed PCs

By Eric Dittert
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The Boot Integrity Services (BIS) API enables preboot management applications to check the integrity and authorization of programs and data downloaded over the network. It provides a secure and interoperable remote boot security solution for managed PCs.

The Boot Integrity Services (BIS) API enables preboot management applications to check the integrity and authorization of programs and data that are downloaded over the network, providing a more secure and interoperable remote boot security solution for managed PCs.

While there's no question that remote boot and other remote preboot management operations improve PC manageability, the lack of a standard preboot security solution has in the past made networked PCs vulnerable to unauthorized use, tampering, and accidental misconfiguration. And once exposed to such a threat, a PC's state is always suspect thereafter. All of this is changing, however, thanks to the BIS application-programming interface (API).

The BIS API is an open specification of a BIOS service defined by Intel and other Wired for Management (WfM) participants as part of the WfM Baseline v2.0. BIS is also an essential element of Intel's 1999 platform security roadmap. Implementing the BIS API in the BIOS and using BIS capabilities in PC management applications now enables PC original equipment manufacturers (OEMs) and management application vendors to provide customers with systems that can be remotely managed while controlling the risk of unauthorized access and the associated loss of integrity.

All About BIS

Although BIS employs public-key cryptography based on complex mathematical algorithms, the way in which an application uses BIS is very straightforward and comprises just four main steps: key-pair generation, client configuration, data signing, and verification on download.

1. In this step, BIS generates a pair of cryptographic keys—one public and one private—in the server environment. These keys are owned by and identify the administrator of the client PCs that will receive downloaded programs and data.
2. The administrator's public key, which is embedded in a digital certificate that also contains administrative information, is stored on each client PC during configuration.
3. In this step, a utility (part of the management application) uses the administrator's private key to create a digital signature on the management server for each program or data file intended to be downloaded to a client during preboot management.
4. Whenever the management application downloads a program or data to the client during a preboot management operation, the corresponding digital signature file is also downloaded. The client program that performs the download then calls the BIS API to perform verification before allowing the data to be used or the program to be executed. BIS checks that the digital signature corresponds to the combination of the downloaded program or data and the key pair for which it has the public key.

Security for Remote Management

With these steps in mind, it's easy to see how a remote boot facility such as the WfM Preboot eXecution Environment (PXE) uses BIS to help keep client PCs safe from unauthorized access. Each client is configured with the administrator's public key, and each boot image file on the remote boot server is signed. When the PXE client agent (which is built into the PC BIOS or the PC's NIC) downloads a boot image, it also downloads the corresponding digital signature file. Only if the check of the boot image and the signature performed by BIS succeeds does the PXE agent allow the boot image to execute.

The boot image, in turn, will likely download additional programs and data. It can also use BIS to verify the integrity of the items it obtains from the server. With each stage verifying the integrity of the next stage before execution, system administrators have a high level of assurance that the client is protected throughout preboot operations.

BIS-Enabled Platforms and Applications Coming Soon

BIS uses widely accepted standards for security-related algorithms and data formats, including RSA and DSS digital signatures, X.509 v3 digital certificates, and Signed Manifest data integrity credentials. This helps to ensure that the underlying software technology needed to construct BIS-enabled products is readily available. In addition, Intel has created a software development kit that enables OEMs and management application independent software vendors (ISVs) to easily incorporate BIS capabilities in their products.

As a result, BIS-enabled platforms and applications that use BIS—in particular PXE—are currently being developed and will be deployed soon. Every PXE v2.0 client agent in a NIC or a BIOS will use BIS, and PXE v2.0 boot servers will support BIS-enabled clients. In fact, some major OEMs and ISVs plan to ship BIS-enabled products as early as Q3 of this year.

The message is clear: BIS delivers immediate user benefits and will soon be widely deployed. In helping to safeguard PC integrity during preboot management, it represents an important step forward on the path to the trusted connected PC.

About the Author

Eric Dittert is a software architect in the Intel Architecture Labs, where he helps lead the development of security and PC manageability solutions.

For More Information

For more information on BIS, please check out the following Web site:

- [The Wired for Management Baseline v2.0 and BIS API specification](#)

Scalable IAL 3D Software Enhances Game and Web Site Development

By Matthew Langie
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Intel Architecture Labs
Intel Corporation

Scalable technologies such as multi-resolution mesh and MetaStream mean that Web site developers now only have to author content once. It paves the way for reduced development costs and more robust computing experiences.*

Thanks to Intel® Architecture Labs (IAL) scalable technologies such as multi-resolution mesh and MetaStream*—co-developed with MetaCreations—game and Web site developers now only have to author content once, paving the way for reduced development costs and more robust computing experiences.

As faster and faster microprocessors are brought to market, software developers and 3D content creators face a difficult choice: should development efforts focus on providing the richest content that looks and runs great on the newest PCs, or should those efforts be targeted at the larger installed base of older, slower computers? More often than not, compromises are made that result in content that falls short of reaching the potential envisioned by its creators.

To date, the only way to circumvent this dilemma has been to create multiple content versions to meet the diverse needs of yesterday's, today's, and tomorrow's PCs. As a result, many game developers have been compelled to create a number of different static level-of-detail (LOD) models for game play, while Web site developers have been forced into creating "high bandwidth" and "low bandwidth" sites. Unfortunately, these multiple iterations can double—or even quadruple—the time and cost associated with content creation.

Scalability is Key

The solution to this dilemma is software scalability, namely, tools and technologies that enable 3D software to automatically adjust itself to run optimally on available processing power and bandwidth. With scalability, game and Web site developers only need to author their content once, saving the considerable time and expense entailed in authoring multiple versions.

IAL has been active in developing and enhancing two enabling technologies, multi-resolution mesh (MRM) and MetaStream (co-developed with MetaCreations), that pave the way for scalable, author-once 3D software solutions. Tools based on IAL MRM algorithms enable developers to create 3D polygon objects with multiple levels of resolution, eliminating the need to create multiple static LOD models. With MRM, a single high-resolution model targeted for the very fastest PCs can maintain a simple topology that provides optimal resolution and performance when run on older PCs with less processing power.

IAL has also integrated MRM functionality into MetaStream, a powerful 3D file format jointly developed by Intel and MetaCreations which allows "streaming" of three-dimensional images and backgrounds on the Internet in real time. Because MetaStream's 3D file format is smaller and more compressed than other solutions, it paves the way for faster downloads and real-time effects such as rotating and scaling objects on the Web. In addition, MetaStream provides Web site designers with multi-resolution control that ensures consistent, high-quality viewing of 3D objects, regardless of the processing power of an individual user's PC.

Digimation: The Tools of the Trade

Intel has licensed its MRM and the MetaStream technology to Digimation, a provider of easy-to-use 3D software development tools that efficiently and effectively address the needs of content creators. Game and Web site developers can easily integrate these tools into their existing authoring paths, enabling them to spend less time on the learning curve while focusing their efforts on creating more robust and better-looking content.

Digimation recently entered into a strategic partnership with Kinetix, a division of Autodesk which develops and delivers content creation tools, as the preferred publisher and distributor for commercial plug-ins for Kinetix's award-winning 3D Studio MAX* and 3D Studio VIZ* solutions. Today, Digimation offers two powerful tools for creating scalable 3D software content. The first is the MultiRes Plug-In for 3D Studio MAX, which enables developers to author multi-resolution mesh objects. And the second is the MultiRes Software Toolkit, a programming tool that includes an instruction guide and sample code for integration into a developer's game or Web site engine.

Longer Shelf Life

The relationship between Intel and Digimation serves as a prime example of how IAL is working to deliver leading-edge technology to the digital content creation industry. The scalability provided by multi-resolution mesh technology and MetaStream automatically maximizes the performance and resolution of 3D content to whatever processing power is available, saving developers time and money with enabling the creation of better games and Web sites.

In addition to optimizing performance on today's PCs, scalable 3D software technology also enables game developers to focus on designing titles that go beyond the capabilities of today's processors. This means that game titles can have a longer "shelf life," due to the fact that they'll look even better as faster processors come to market. With greater control over performance, developers may also choose to include more in-scene content or devote additional processing overhead to other elements such as physics, 3D audio, and Artificial Intelligence (AI), to name a few examples.

By any measure, the door is open for game and Web site developers to scale new heights when it comes to the next generation of 3D software content. And IAL and its licensees are committed to further enabling these capabilities to ensure that PC users benefit from the richest and most robust computing experiences possible.

About the Author

Matthew Langie is the strategic marketing manager for 3D software technologies developed in the Intel Architecture Labs. His responsibilities include formulating strategies, defining marketing plans, and licensing technology solutions to leading game and Web site developers.

For More Information

For more information on Intel's 3D software, please check out the following Web sites:

- [The IAL Web site](#)
- [Digimation](#)

Bluetooth* Technology: “Connected PCs to Go”

By Simon Ellis
Data Communications Marketing Manager
Mobile & Handheld Products Group
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Designed for growing legions of mobile PC and mobile phone users, Bluetooth technology provides the capability to get connected anytime, anywhere around the globe—free of cumbersome proprietary cables and connectors.

For users of mobile computing devices and wireless communications products, “Bluetooth” is another word for freedom. Designed for growing legions of mobile PC and mobile phone users, Bluetooth technology provides the capability to get connected anytime, anywhere around the globe—free of cumbersome proprietary cables and connectors.

Bluetooth is the code name for the rapidly emerging global specification for wireless connectivity for mobile PCs, handheld computing devices, wireless phones, headsets, other wearable devices and computer peripherals including printers, in addition to human interface devices such as datapads and mice. Led by Intel, Ericsson, IBM, Nokia, and Toshiba, the Bluetooth Special Interest Group (SIG) was established to create a global specification for a wireless communications interface and control software, in order to ensure device interoperability.

Open Specification

The SIG is now actively engaged in working out regulatory issues around the world. To encourage the widest possible deployment of the technology, Bluetooth is an open industry specification that will be made available to Bluetooth SIG members on a royalty-free basis. The growing momentum behind Bluetooth is indicated by the fact that the SIG recently enrolled its 500th member company.

To create a specification for the connection of mobile devices without cables, Intel and other SIG members needed to address three important issues:

- The relatively high cost of adding wireless communications capability to mobile computing devices;
- The need to adapt to the established usage models for mobile computing devices and phones—and the need for a device-independent, interoperable technology;
- The absence of a global wireless standard, with no one networking standard currently available worldwide.

The goal of the Bluetooth SIG is to deliver cable-free mobile devices at the right cost, the right size and the right power consumption. The concept of simply embedding a cellular phone within a mobile computer was rejected early on because of its prohibitively high cost, coupled with the fact that the 2-mile range of cellular phones is unnecessary. Most mobile computing devices are used within close proximity to existing networks in offices and homes—including LANs and Public Switched Telephone Network (PSTN) equipment. Network access points can provide Bluetooth radio links to mobile equipment. It is also anticipated that a USB dongle will be available to enable radio links to desktop PCs.

Low-Power Frequency Hopping Radio

A low-power radio interface was chosen, operating on the globally available 2.45 GHz band. The radio air interface features nominal antenna power of 0 dBm and complies with FCC rules for the ISM band. Spectrum spreading is accomplished by frequency hopping, with 79 hops spaced by 1 MHz, between 2.402 GHz and 2.480 GHz. The frequency hopping rate is 1,600 hops/sec., and the nominal radio link range ranges up to 10 meters, although range can be extended up to 100 meters by increasing the transmission power.

Low Cost

It is estimated that integrating compliant radios into devices will initially cost about \$30 (USD) per unit.



This includes the antenna and software components. It is expected that unit costs will ultimately drop to the vicinity of \$10 (USD) or lower, depending on the partitioning, volumes, and certification requirements. The Bluetooth specification targets power consumption at 30 μ A in “hold” mode to a transmitting range of 8–30 mA.

Voice and Data

The Bluetooth radio supports different transfer types for different needs. Both isochronous transfers for voice and asynchronous links for data applications are supported, and there are various error detection and correction schemes available. The asynchronous channel supports 721 Kbits/sec. in either direction and 57.6 Kbits/sec. in the return direction, or a symmetric link of 432.6 Kbits/sec. The voice channels each support links of 64 Kbits/sec. The system can support three simultaneous voice connections.

Making Mobile Devices More Useful

Bluetooth technology has been termed the “personal area network” because it will allow users of phones and mobile computing devices to use the Internet and other networking applications any time and anywhere they happen to be. For example:

- With Bluetooth technology, a single phone could serve a LAN-based intercom in the office, a portable phone at home and a mobile (cellular) phone on the road.
- Mobile PCs and handheld computing devices can be used to surf the Web via either a mobile phone link, PSTN, ISDN LAN or xDSL.
- A cordless headset can keep users connected to a mobile PC, or to any wired connection.

These and other interesting usage scenarios are described at the [Bluetooth SIG Web site](#), including the “briefcase trick,” the “automatic synchronizer,” and the “forbidden message.”

The Bluetooth SIG Web site also includes a calendar of events, including anticipated dates for the availability of the Bluetooth specification, an anticipated product roadmap and a list of the 500+ members of the Bluetooth Special Interest Group.

For developers, the best way to learn more about Bluetooth technology is to join the 500 companies who have already become members of the Bluetooth SIG. They are about to provide “Connected PCs to go” at the right cost, the right size, and the right power consumption. This is the right time to join them.

About the Author

Simon Ellis works in the Mobile and Handheld Product group in Intel. He manages a marketing group focused on demand creation. His current responsibility is driving the Bluetooth marketing efforts. The program was launched in May 1998 and products are expected in the marketplace in 2000.

For More Information

For information on membership in the Bluetooth Special Interest Group and an overview of the technology, visit the [Web site](#).

High Concept comes to the PC: Form, Function, and Fashion

By Nancy Sumrall
PC EOU Platform Marketing
Intel Desktop Products Group
Intel Corporation

The era of the PC as a big beige box crowding the desktop is almost over. New and ergonomically attractive PC designs made their debut at the February Intel Developers' Forum, as Intel hosted a "fashion show" to preview the shape of things to come.

The days of the PC as a big beige box crowding the desktop are coming to a close. Intel provided a glimpse into the near future by unveiling a number of new ergonomically attractive PC designs at a "fashion show" during the February Intel Developer Forum (IDF).

In the 20 years since it first became part of the computing landscape, the personal computer has come a long way indeed. To compare the performance and functionality of the PC of today to that of its early forebears is somewhat like comparing twentieth century civilization to prehistoric man—the difference is that dramatic.

But the one area where PCs have not changed all that much is in their appearance and form factor. There may be more processing power and integrated technology inside the box than ever before, but comparing the look of today's mainstream PCs with their 1979 counterparts reveals a common bloodline—one, unfortunately, that has not been inclined toward physical attractiveness or ease of use.

One of the big reasons that many consumers still don't have a PC in their homes is because computers are still too complicated to use. Simplicity is needed, not only in peripheral interface technology, but also in form factor design. That's because one of the main complaints that current PC users have is that their desktops simply don't have the space to accommodate clumsy, space-consuming computers, monitors, and peripherals. Function alone is no longer enough, as form is playing an increasing role in purchasing decisions.

Promoting Ease of Use

Simplicity is the key to improving PC usability. The focus in 1999 is centered on technological advances such as Legacy Removal (ISA-free), Instantly Available PC (IAPC), USB, and FlexATX Motherboards. Freed from the legacy of the ISA bus, the future PCs will also be devoid of parallel or serial ports, relying instead on a Universal Serial Bus (USB) port. Making the PC Instantly Available, enables users to walk up to the PC and quickly access applications and data based on the users' wants/needs/desires without having to endure a lengthy boot process. The FlexATX motherboard platform, form factor, specifications, software, and other elements to improve PC Ease of Use are targeted for top-to-bottom system solutions.

But style is changing too, and the days of the big, beige box on the desktop are numbered. Innovative new and highly attractive designs are poised to emerge in the marketplace. This emergence was one of the themes at the February IDF, where Intel hosted a fashion show to give conference attendees a preview of the shape of things to come.

Ergonomics at Work

Ergonomics is the applied science of designing and arranging things that people use in a way that promotes more efficient interaction. And ergonomics was on display at February IDF, where Intel unveiled an exciting array of new PCs developed in conjunction with some of the country's leading product designers. Models clad in bunny suits paraded down a runway displaying these new designs—some of which are already available on the market—to an appreciative audience of IDF attendees.

Ziba Designs, which previewed its Aztec* and Twister* PCs at the September 1998 IDF, contributed three new designs at the recent show. Ziba's new KOI* and CASTIA* PCs—targeted at teens and children, respectively—both integrated a DVD drive into highly compact form factors designed to appeal to their respective age groups. The highlight of Ziba's new entries was the TETRA*, a fully functional PC with a DVD drive and a 500 MHz Intel® Pentium® III processor, USB, LAN, DDWG connector, and AGP2X—all encased in an attractive package weighing just 4 pounds.

Portability is the word for In Sync's new FLEX* PC, which features a flat panel display connected to a removable base armed with a shoulder strap to facilitate mobility between home and office. And fashion and style were in evidence in two new models from Anderson Design's Velocity Group. The IKEBANA* transforms peripherals attached to the PC into decorative features that turn the beige box of old into a beautiful bouquet more suggestive of a centerpiece than a computer. And the FUN-KSHUN* features a handsome casing with coordinated mouse, keyboard, and peripherals.

Other outstanding designs included a new flat panel PC, available now from Swedish company MultiQ; Stratos' Silicon Bonsai*, a complete home information center packaged in a unique vertical footprint which also included a 500-MHz Intel Pentium III processor, USB, LAN, DDWG connector, and AGP2X; and Accelerated Performance's SwivelTop*, a flat panel unit mounted on a lazy Susan which disappears into the desk when not in use. Palo Alto's FlexATX design, Hauser's 500 MHz Intel Pentium III processor-based PC for novice users, and a 42" flat-screen plasma display from Philips rounded out an impressive array of offerings at the show.

Every Picture Tells a Story

Ease of use and simplicity matched with elegant design were the watchwords at the IDF Concept PC fashion show. But no amount of words can match a picture for describing the ergonomic beauty and style of these next-generation PCs. To see those pictures—and with it, the future of the PC—please be sure to visit the [Web site](#).

About the Author

Nancy Sumrall is in PC EOU Marketing for Intel's Desktop Products Group, where her responsibilities focus on the development of industry initiatives to promote PC ease of use, technology, and conceptual design.

For More Information

- [Ease of Use: A Challenge for the Industry](#)
- [Connecting "Beyond the Spec"](#)

Ease of Use Building Blocks:

- [Ease of Use Starts with Legacy Removal](#)
- [Concept Platform Accelerates Legacy Removal at IDF](#)

Fall '99 IDF Articles:

- [Intel gives a peek at future PC designs](#)
- [When a PC becomes part of the furniture](#)
- [Intel Developer Forum Keynote Speech, by Pat Gelsinger](#)
- [Intel Announces New FlexATX Motherboard Form Factor for Low-cost, Easy-To-Use PCs](#)

Other Related Links:

- [Instantly Available PC \(IAPC\)](#)
- [USB](#)
- [Motherboards](#)
- [Chipsets](#)
- [Clarifying the Digital Display Interface Picture](#)
- [Reducing Total Cost of Ownership with Intel® WfM and Microsoft ZAW Initiatives](#)

Momentum Grows Behind Next Generation I/O

By Tom MacDonald
General Manager
NGIO Division
Intel Corporation

Much has happened since Intel first described Next Generation I/O architecture last fall. Here is a progress report, and an invitation for interested developers to join the NGIO Forum—your authoritative source for detailed technical information.

Intel first described Next Generation I/O (NGIO) architecture last fall. Since then, much has happened. In this article, we will give you an update on progress since last fall, and tell you where to go to get further information.

Getting Involved

Developers of I/O controller hardware, subsystems, or server systems, should join the [NGIO Forum](#). This independent industry organization is the group that owns the NGIO technology specifications. It's the best place to get detailed information and support from peers about the technology. You don't have to be a member of the Forum to see the NGIO specifications once they are released, but if you want to participate in the evolution of the technology itself, you have to be a member of the Forum. Only members can participate in working groups, see early versions of draft specifications, etc.

Motivations for NGIO

Virtually all server systems in use today, with one notable exception, use a shared-bus, memory-mapped method to link peripheral controller devices to server main memory. By far the most widely used system bus is PCI.

PCI was developed originally for use in PCs, but it has been broadly and successfully deployed by server manufacturers in server systems of all kinds. PCI has served the industry well, and will continue to do so for a long time to come.

The widespread deployment of "I/O-centric" Internet applications for Web servers, e-commerce, TCP/IP networking, mail services, and on-line transaction processing is now creating demands on server I/O subsystems that PCI simply cannot address. Those demands relate primarily to the reliability and scalability of the connection between server memory and I/O peripheral controller devices.

On the Internet, it's not acceptable to be down for hardware maintenance or because systems have failed due to device conflicts. It's not acceptable to run out of space in your server room because your servers weren't designed to support high-density rack mounting. And it's not acceptable to be unable to add service because you're out of slots. PCI was not designed to address these needs, and cannot be efficiently extended to do so. Something new is required, something that complements PCI and takes server I/O architecture to the next level.

Next Generation I/O is the I/O architecture that will bring about this architectural advance while retaining the same benefits of broad industry acceptance and low cost that have been the hallmarks of PCI.

The notable exception to the PCI rule mentioned above? The S/390 mainframe I/O architecture. Mainframe I/O has always used channels to link peripheral controllers to host memory. The controllers themselves have no direct access to host memory. They can only communicate with the channel controller, which in turn transfers data in and out of main memory on behalf of the target controller. Mainframes deliver high aggregate data throughput using this architecture, in spite of the fact that most of the installed base of mainframes still operate with individual channels that can transfer no more than 19 MB per second of information—significantly slower than even the lowest-speed version of PCI.

Mainframe I/O is very capable, but it is also very expensive. And there are only a very small number of

companies who deliver I/O solutions for the platform. It simply is not the standards-based, high-volume, low-cost technology platform that the era of Internet e-commerce demands. NGIO is the modern, low-cost channel I/O architecture that the real needs of the Internet demand. Each NGIO link is more than 10 times faster than legacy mainframe links, and 2.5 times faster than the current highest-performance FICON link. NGIO is also designed to be at least an order of magnitude lower cost than S/390 mainframe I/O.

Taking I/O to a New Level

NGIO was designed from the outset to meet the demands of the Internet and mission-critical e-commerce applications. NGIO is a fundamentally new technology, designed from the outset to address the reliability and scalability needs of mission-critical platforms of all kinds.

NGIO consists of three essential elements:

1. A channel interface
2. A switching fabric
3. Target channel-attached devices

The channel interface is the most important aspect of NGIO, though that fact is often missed. The channel interface builds on the core concepts of the Virtual Interface (VI) Architecture, which was originally developed in Intel's Server Architecture Lab and is now supported in all of the parallel-scalable database products. The channel interface defines the data structures and command semantics which must be used by any NGIO-conformant device, device driver, or application which uses NGIO to communicate with host memory.

The channel interface is independent of processor architecture. Sun is an active participant in the development of NGIO because they see the same benefits for their SPARC* processor-based systems that we see for Intel-based systems. The primary benefit of the channel interface is that it completely decouples the I/O subsystem from the processor. All I/O operations become fully write-cacheable as a result, which should significantly improve performance as processors become faster and faster in the future.

The switching fabric is comprised of two elements: 1) high-speed (2.5 Gbits/second, bidirectional) serial links, and 2) very simple devices that switch NGIO packets between ports in their journey from source to destination and back. The link protocol for NGIO is specifically designed for maximum performance, predictability and reliability in carrying any form of communications from host memory to destination I/O controller. No device can "hog the bus" and receive more than its fair share of resources with NGIO. All devices are fully isolated from one another, so a failure of one device cannot produce failures of another device or of an entire host system, as is too frequently the case with shared-bus, memory-mapped I/O.

Since there is only one protocol running over the NGIO links at the wire level, and since there is a finite upper limit on the number of endpoints that can be attached to the fabric (64K), switch elements should be very simple, very fast, and very low cost. NGIO switches don't have to do all of the things that Fibre Channel or Ethernet switches need to do. But their presence in the system will allow Fibre Channel and Ethernet devices to interact with server host memory much more efficiently and reliably than they can today.

Target channel-attached devices are the functional equivalent of today's PCI cards. The difference is that these devices attach to the NGIO channel interface instead of to the PCI bus, and they communicate with main memory through NGIO messages, not through load/store commands to/from memory-mapped addresses.

Target channel devices will come in many different forms. The basic building block is a chip or chipset that has an NGIO interface (one or multiple) on one side, and an I/O device interface (Fibre Channel, SCSI, Ethernet, FDDI, ATM, etc.) on the other. This device could be configured in any number of ways:

- Soldered directly to a server baseboard
- Placed on an I/O card that snaps into a slot in an I/O rack
- Soldered directly on the baseboard of a dedicated I/O subsystem, such as a Fibre Channel subsystem

The NGIO Forum has recently chartered a working group whose goal is to describe a preferred form factor for the I/O card and rack option. (The only truly required form factor for NGIO is the high-speed serial connector that links the target device to the switching fabric itself.)

NGIO Momentum Grows

The formation of the NGIO Forum was announced on January 7 by the six companies who currently make up the steering committee for the organization: Dell Computer Corporation, Hitachi Ltd., Intel, NEC Corporation, Siemens AG, and Sun Microsystems. It became possible for the broad industry to join the Forum on February 23, when the membership documents and group bylaws were completed by the steering committee members. The NGIO Forum sponsored a membership event on February 23 that was attended by more than 150 individuals from more than 60 companies.

Since then, more dozens of companies are in the process of joining the Forum. The Forum has also chartered a number of working groups:

- Architecture Working Group
- "Fat Pipes" Working Group
- Form Factors Working Group
- Marketing Working Group

Members of the Forum are eligible to participate in these working groups, and the proceedings of these working groups are visible to any Member, regardless of participation status.

The NGIO Forum has one primary objective: to create the NGIO specifications and to facilitate the creation of interoperable products using the specifications.

Intel is supporting the objectives of the Forum in two ways. First, by participating actively in the Forum itself, and second, by designing key building-block silicon products that will help the industry to build customer-ready solutions using NGIO. Intel building blocks will include silicon components, software, and system-level building blocks and other tools and collateral to enable broad deployment of NGIO-based products in the market in 2000. Technical specifications for these products will be available shortly under NDA for customer use in planning NGIO-optimized products. The components themselves are targeted for availability in line with supporting end product availability for NGIO-optimized products in 2000.

The growth of the Internet and wide deployment of Internet applications make server I/O capabilities a key issue for system vendors and Independent Hardware Vendors (IHVs). NGIO architecture provides a fundamental advance in platform capabilities. Once end customers, especially Internet Service Providers, see what NGIO-based products can do in terms of enhanced reliability, increased server system density, response time, and ease of maintenance, NGIO will quickly become their preferred I/O interface choice.

NGIO represents a tremendous opportunity to participate in the rapid growth of the Internet and the continuing integration of computing and communications through an open industry process. Those who recognize this opportunity and move quickly to implement will see significant rewards.

About the Author

Tom Macdonald is the General Manager of Intel's NGIO Division.

For More Information

For information on membership in the NGIO Industry Forum and working groups, visit the [Forum Web site](#).

For an overview of NGIO including The Aberdeen Group technical white paper *Next Generation I/O: a New Approach to Server I/O Architectures* visit [Intel's NGIO Web site](#).

Technology News Bytes

IDF News

[Intel Breaks Gigahertz Barrier](#)

Intel broke the 1 GHz speed barrier for a general-purpose microprocessor in a demonstration at the Intel Developer Forum Feb. 23 in Palm Springs, Calif. This was the first time the Gigahertz (one billion cycles per second) frequency has been achieved on a general-purpose microprocessor. The technology demonstration used a 0.25 micron Intel® Pentium® III processor.

[The Industry's First Total Suspend to RAM \(STR\) Solution that Fully Supports Intel's Instantly Available PC Initiative for Reduced Power Consumption and Rapid Restart](#)

With an Instantly Available PC, users can allow their PCs to enter a power saving "sleep state" during idle periods and avoid the time-consuming shutdown/restart/reboot process to interrupt and resume operation.

[New Embedded Platform Solutions Featuring the Intel® Celeron™ Processor](#)

In a keynote presentation, [Ron Smith](#), corporate vice president and general manager, Intel Corporation's Computing Enhancement Group, announced new platform solutions featuring the Intel® Celeron™ processor for communications, transaction terminal, and industrial computing embedded systems. More information about the embedded Pentium processor family is available at <http://developer.intel.com/design/intarch/celeron.htm>

[Developers Gain New Graphics Tool](#)

The latest versions of Intel's IPEAK family of platform performance and integration tools include a major update of Intel's Graphic Performance Toolkit (GPT). Beta Version 2.0 of GPT now supports DirectX® 6.1, the latest version of Microsoft Corporation's multimedia programming interface software for Windows® operating systems.

[Maxtor Case Study](#)

This week Intel also released results of a new case study conducted at Maxtor Corporation, describing how Maxtor applied the IPEAK Storage Toolkit to analyze, verify, and improve the performance of its disk storage subsystems. The Maxtor case study is available for viewing or downloading at: ["Geyserville" technology—bringing near-desktop performance to mobile PCs.](#)

Intel has demonstrated a revolutionary new mobile processor technology that is expected to close the performance "gap" between mobile PCs and their historically higher performance desktop counterparts. The demonstration at the Intel Developer Forum illustrated an Intel dual-mode mobile processor technology, code-named "Geyserville," that allows a mobile PC user to operate at a higher frequency when plugged into a wall outlet and automatically switch to a lower power and frequency when running on battery, conserving battery life.

[Industry Uniting Around Intel® Server Architecture](#)

Today, the server industry is rallying around a number of platform initiatives for Intel Corporation's Intel® Architecture (IA). These initiatives demonstrate the value of a unifying server architecture as enterprise solutions and the Internet undergo dramatic growth. To access references for organizations and specifications, go to the [Press release](#).

[Enterprise Technology Center and Chipset Program for Future Merced™ Processor](#)

Intel announced the opening of an Enterprise Technology Center and a cooperative Merced chipset development effort for future IA-64 based servers. Located in DuPont, Wash., the Enterprise Technology Center will provide a collaborative environment for Intel and enterprise solution providers to co-define and develop specifications and implementations of advanced core technology features for future IA-based server platforms.

[Intel and Wiley Publishing Form Intel University Press](#)

Intel and John Wiley & Sons, Inc., announced a joint publishing agreement that will generate a book series marketed under the name Intel University Press. Intel University Press will provide the industry with information needed to design and innovate Intel Architecture-based systems. The resulting titles will supply computer system designers, integrators, and system management professionals with critical information that enables them to differentiate their Intel Architecture-based products and to better manage their computing infrastructure.

[Intel Targets Speed, Security, Simplicity, and Style as Industry Imperatives for Next Generation of Computing Platforms](#)

Over 1,500 developers view new Intel tools, roadmaps, and guidelines that support broad industry advancements.

[Intel Announces New FlexATX Motherboard Form Factor for Low-cost, Easy-to-Use PCs](#)

A new motherboard form factor from Intel will enable manufacturers to design smaller PCs for reduced cost, better ease of use, and space-constrained applications. The FlexATX V1.0 specification is an addendum to the microATX motherboard form factor specification that facilitates design of smaller motherboards with fewer legacy features for lower-cost systems, while preserving compatibility with microATX and ATX chassis designs. Along with the FlexATX specification, Intel revealed a Form Factor Roadmap for Desktop Systems for 1999 and beyond.

[Intel sees One Trillion Dollars in Industry E-Commerce Revenues By 2002](#)

Intel Corporation outlined its vision of a billion Internet-connected PCs and millions of servers generating one trillion dollars of annual e-commerce revenues within the next few years.

[Intel and IBM Announce Next Generation PC Alerting with Alert on LAN™ 2 Technology](#)

Intel and IBM announced Alert on LAN 2, the next generation of Fast Ethernet technology designed to simplify PC management. Alert on LAN 2 technology enables remote management capabilities through the network interface and is a direct result of the Advanced Manageability Alliance (AMA) formed by Intel and IBM in 1996.

[Intel Introduces Pentium® Processors and Chipsets for In-Car Computing](#)

Intel announced Extended Temperature Pentium® processors with MMX™ technology and supporting chipsets that have been designed to meet the stringent requirements of the automotive environment. The products are intended to bring new capabilities to the car, in support of its Connected Car PC vision of platforms for navigation, communication, entertainment and information.

[Compaq, Hewlett-Packard, Intel, Lucent, Microsoft, NEC, and Philips to Lead Development of USB 2.0 Specification](#)

The formation of a new group of seven core companies that will lead the introduction of the USB 2.0 specification, increasing bandwidth capacity by 10 to 20 times, was announced IDF. USB 2.0 will move the specification from 12 Mbps to between 120-240 Mbps. It will provide a connection point for next-generation peripherals that complement higher performance PCs.

[Portable Device Driver Development Reaches Milestone Toward Becoming Industry Standard](#)

At IDF members of Project UDI (Uniform Driver Interface) announced version 0.90 of the UDI Specification, a major milestone in the ongoing effort to deliver a single, cross-platform device driver. This specification will be freely available from <http://www.sco.com/UDI> in March 1999. With this release, the UDI Specification is functionally complete and ready for broad public review. A two-month review period will be held, after which the final 1.0 spec will be published by mid-1999.

Other Intel News

[Intel Ships Fastest Celeron Processor for Value PCs](#)

Intel has announced the Intel Celeron processor at 433 MHz, the fastest Intel processor for value PCs. This processor offers leading performance at an exceptional price, and it gives consumers the power to handle everything from the Internet to interactive games.

[Intel Unveils Pentium® III Xeon™ Processor for Workstations and Servers](#)

At **CeBit** Intel has unveiled its Pentium® III Xeon™ processor family, extending Intel's products further into e-commerce and high-end computing solutions. The company also outlined its strategy to provide a foundation for the Internet via powerful Intel Architecture-based servers and workstations.

[Broadcast.com Teams with Intel to Host Live Video of Art Bell's "Coast to Coast AM"](#)

Broadcast.com announced the exclusive video debut on the Internet of the #1 nighttime talk show "Coast to Coast AM" hosted by Art Bell. For the first time, Bell's audience of more than 7 million listeners can watch him hosting his radio show live from his studio, exclusively at <http://www.broadcast.com>. Broadcast.com is teaming with Intel to enable this new experience, which is made possible through RealNetworks RealSystem™ G2* product line, incorporating Intel® Streaming Web Video software, which provides a new level of streaming video quality over low and high bit-rate connections.

[Intel Introduces L440GX+ Server Board for Pentium III Processors](#)

Intel Corporation announced the [Intel® L440GX+ Server Board](#) which offers up to three times more PCI bandwidth than other dual processor boards and gives computer resellers a new building block to help enhance network performance.

[Intel and Dassault* Systemes to Work Together on Software Optimization for Intel Architecture and Pentium III Xeon Processor](#)

Intel and Dassault* Systemes announced that they have agreed to work together to optimize for current and future generations of Intel processors CATIA*, the world's leading software for certain modeling and design applications. Dassault Systemes's CATIA Version 5 takes advantage of the performance boost offered by the Pentium III Xeon processor.

[Intel announces the Intel® PRO/100 CardBus II and the Intel® PRO/100 LAN+Modem56 CardBus II, the newest PRO/100 Fast Ethernet adapters for mobile PCs.](#)

These new CardBus mobile adapters combine RealPort* Integrated PC Card design with the power of the new Intel® 82559 Fast Ethernet controller for greater reliability and more manageable mobile connections. The RealPort Integrated PC Card provides enhanced functionality and ease of use by eliminating the need for external connectors (dongles).

[Game Developers Adopt Intel Labs Technologies](#)

Digimation, DreamWorks Interactive, Pandemic Studios, and Valve license Intel Architecture Labs' Multi-Resolution Mesh Software to enable enhanced graphics for leading-edge 3-D games.

[Nortel Networks Moves Enterprise Voice Solutions to Intel Architecture](#)

Intel Corporation and Nortel Networks announced a broadening of Nortel Network's use of Intel Architecture as the foundation for the company's extensive suite of enterprise voice solutions, shifting them to a more open set of offerings that include Intel's microprocessors.

[VA Research to Port Linux* Operating System to Intel's IA-64 Architecture](#)

Intel Corporation and VA Research Linux Systems today announced that they have signed an agreement for VA Research to port the Linux* operating system to Intel's future IA-64 architecture. VA Research will deliver the optimized port, in synch with Merced-based system availability in mid-2000.

[Intel says FTC Order Provides Framework for Handling Intellectual Property Disputes](#)

Intel Corporation said today it is pleased that the settlement agreement submitted last week has been approved by the Federal Trade Commission (FTC). This agreement approved by the Commission was jointly developed by Intel and FTC's Bureau of Competition to settle the pending litigation between them.

[Intel Announces Easy BGA Chip Scale Package For Flash Memory](#)

Intel announced its new Intel® Easy BGA flash memory chip scale package (CSP). The new package is 50 percent smaller than an industry standard Thin Small Outline Package (TSOP), measuring 10 mm by 13 mm, with an 8 mm by 8 mm pinout.

[Now Available—the Intel Pentium III Processor Streaming SIMD Extensions](#)

The Pentium III Processor offers Streaming SIMD Extensions—70 new instructions enabling advanced imaging, 3D, streaming audio and video, and speech recognition applications.

Industry Events in April 1999

WinHEC '99 (Windows* Hardware Engineering Conference)

April 7–9, Los Angeles, CA

This year, Microsoft expects 4,000 managers, developers, planners, and engineers from semiconductor makers, peripheral makers, and system manufacturers at its annual gathering for the computer hardware industry. At WinHEC '99, Intel will demonstrate technologies from the Spring '99 Intel Developer Forum Conference, highlighting desktop, workstation, server, mobile, and embedded platforms.

Showcased technologies include the work of the DDWG, Instantly Available PC, the WTX form factor, the Intel® Pentium® III Xeon™ processor, and Intel's platform tuning and integration tools. Intel is also showing selected concepts from IDF's Next Generation PC Fashion Show.

Intel architects will speak on WBEM/CIM, ACPI 2.0, and DDWG. Pat Gelsinger, Corporate Vice President and General Manager, Desktop Products Group, will present a keynote on Thursday, April 8 at 8:45 a.m.

Spring Internet World

April 12–16, Los Angeles, CA

The world's largest event for e-business and Internet technology, Spring Internet World offers direct access to the very best tools, talent, and technology. To meet the growing demands of the rapidly evolving business-to-business Internet market, this year Spring Internet World introduces a brand new concept—a targeted conference program and vertical technology showcases... all under one roof.

Intel is a corporate sponsor of Spring Internet World and will be exhibiting at the show. Sean Maloney, Senior Vice President and Director, Sales and Marketing with Intel Corporation, will present the Internet World Industry Awards Presentation and Opening Keynote Wednesday, April 14, 9:00 a.m.–10:15 a.m.

NAB '99

April 19–22, Las Vegas, NV

The National Association of Broadcasters annual conference is the largest, the longest-running, and most influential conference for broadcasters in the world. Intel will be exhibiting at NAB '99 and showcasing its work with the Digital Broadcast Initiative.

ISPCON Spring '99

April 26–29, Baltimore, MD

Billed as "the leading trade show dedicated to the Internet Service Provider," ISPCON Spring '99 will gather thousands of Internet Service Providers, CLECs, RBOCs, ITSPs, Cable Operators, and Web Hosting companies for an intensely educational event focused on the business of providing Internet services. Intel will be attending and exhibiting as well as making an industry-level announcement during the show.

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